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There is only one form of criticism which is useless, and it is one which is unfortunately too common, viz. that the result is right or wrong according as it agrees with the critic's preconceived notions as to what it should be. It is for this reason I have not published the value of the assumed parallax; and as all useful criticism can equally well be made without this information, I think it is better to defer the publication of any value of the parallax until the definitive result is arrived at.

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## *On Newcomb's Correction to Hansen's Value of the Secular Acceleration.* By E. Neison, Esq.

Prof. Newcomb, in his recent valuable researches on the motion of the Moon (*Washington Observations*, 1875, Appendix ii., 1878), by comparing Hansen's *Tables de la lune* with the observations of the eclipses recorded by the Alexandrian and Arabian astronomers, has shown that Hansen has assigned too great a value to the mean motion and secular acceleration of the Moon. Further, by comparing Hansen's tables with the early observations of the Moon made between 1600 and 1750, Prof. Newcomb shows that the tables entirely fail to represent these observations.

By diminishing the secular acceleration by $3''\cdot86$ and the secular mean motion by $29''\cdot17$, and by rejecting one of Hansen's terms of long period in accordance with Delaunay's researches, and by empirically diminishing by 60° the constant part of the argument of the other, it is possible, as Prof. Newcomb shows, to make Hansen's tables closely represent the motion of the Moon for the whole period, 1625–1875, and very much improve the manner with which they represent the eclipses recorded by the Arabian and Alexandrian astronomers. In this manner Prof. Newcomb obtains $8''\cdot31$ for the value of the secular acceleration of the mean motion which is indicated by observations, a much closer approximation to the theoretical value, $6''\cdot18$, than had hitherto been obtained.

Apart from other considerations this result is of very considerable importance, because it throws much doubt on the supposed tidal retardation of the rotation of the Earth, an hypothesis which has given rise to much speculation, though it has not yet been proved to be possible for the terrestrial tides to produce a secular retardation of the rotation of the Earth.

I wish to show that there is one point in Prof. Newcomb's researches which he seems to have overlooked, and that is, that the value which he assigns to the diminution in Hansen's secular acceleration depends almost entirely on the weight to be assigned to a single eclipse in the numerous series employed by him; so that, by rejecting this eclipse, or by assigning to it a different weight, very great modifications will be introduced

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into the amount by which Hansen's secular acceleration is to be corrected.

The principal data employed by Prof. Newcomb are thirteen eclipses of the Moon of which observations are recorded by Ptolemy, and twenty-two eclipses of the Sun and Moon observed by the Arabian astronomers between 820 and 1004. From these observations, united into groups, Prof. Newcomb derives the following corrections to Hansen's tables:—

| Obs. | Epoch. | ′ | ′ | Weight. | Obs. | Epoch. | ′ | ′ | Weight. |
|---|---|---|---|---|---|---|---|---|---|
| (3) | $-687.\delta\zeta =$ | $-11$ | $\pm 4$ | 3, | | | | | |
| (3) | $-381.$ „ $=$ | $-27$ | $\pm 5$ | 2, | (3) | $850.\delta\zeta =$ | $-3·8$ | $\pm 2·4$ | 8, |
| (8) | $-189.$ „ $=$ | $-20$ | $\pm 3$ | 4, | (7) | $927.$ „ $=$ | $-1·6$ | $\pm 1·7$ | 16, |
| (3) | $+137.$ „ $=$ | $-16$ | $\pm 4$ | 3. | (20) | $986.$ „ $=$ | $-4·5$ | $\pm 1·3$ | 30. |

After correcting Hansen's value of the secular acceleration and mean motion, the tables represent these observations with the following residuals.

| Epoch. | ′ | Epoch. | ′ |
|---|---|---|---|
| $-687$ | $= +17$, | | |
| $-381$ | $= -\ 7$, | 850 | $= -2·8$, |
| $-189$ | $= -\ 4$, | 927 | $= -0·9$, |
| $+137$ | $= -\ 6$. | 986 | $= -4·2$. |

It is obvious that the tables, even when amended, do not satisfactorily represent the observations of these eclipses, since (with a single exception) all the errors tend in one direction. It is in fact impossible to represent the first group of eclipses (mean epoch $= -687$), without introducing enormous discordances in the others; but if this group be rejected, all the others can be well represented. This discordant group of eclipses consists of four, as follows:—

| | | | | ′ | ′ |
|---|---|---|---|---|---|
| $-720$ | March | 19 | $\delta\zeta =$ | $-\ 4$ | $\pm\ 6$, |
| $-711$ | March | 8 | „ $=$ | $-36$ | $\pm 22$, |
| $-711$ | September | 1 | „ $=$ | $-22$ | $\pm 11$, |
| $-620$ | April | 21 | „ $=$ | $-23$ | $\pm 11$. |

Prof. Newcomb rejects the second of these, because it is not specially stated whether the beginning or middle of the eclipse was observed, and combines the other three by assigning to them the weights 3, 1, 2 respectively. The first eclipse has therefore a very preponderating weight attached to it. It is evident, however, that this eclipse is entirely discordant, for it indicates a very small positive correction, whereas all the others retained by Newcomb show very much larger corrections. The mean of the two other eclipses is $-23'$, and the mean of all four $-21'$. By giving this high weight to this one eclipse Prof. Newcomb has rendered its importance so great that it almost overbalances all the others, not only in this group but in all the others.

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If this single discordant eclipse be rejected, but in all other respects the data employed by Prof. Newcomb be retained, whilst the other corrections remain sensibly unaltered, the value of the correction to the secular acceleration rises from −3″·81 to −4″·80. As Prof. Newcomb regards the two other eclipses as doubtful, it seems more satisfactory to reject the entire group, and solve the equations without them. In this way, whilst the correction to the epoch and mean motion remain almost entirely unchanged, the correction to the secular acceleration becomes −4″·97 instead of −3″·81. In this way the ancient eclipses are far better represented, the residuals being

−381 = +2′·4
−189 = +3′·9
+134 = −0′·2
850 = −0′·8,
927 = +0′·6,
986 = −2′·8.

The rejected group is

| Obs. | Epoch. | Weight. | |
|---|---|---|---|
| (2) | −660.δζ = −23′ ± 9′ | 1, | residual = +15′ |

The observations between 1625 and 1875 are still better represented by this value than by that employed by Prof. Newcomb. The result shows that Hansen's value of the secular acceleration can be reduced to as low as 7″·20 or only a single second greater than the theoretical value, 6″·18.

When the Arabian observations of eclipses and the modern observations between 1625 and 1875 are considered alone, they are best represented by the theoretical value of the secular acceleration. Thus, by diminishing Hansen's mean motion by 30″ per century, and his secular acceleration by 6″, so as to obtain the theoretical value, the tables as amended represent not only the observations between 1625 and 1875, but also the Arabian observations, the residuals being

$$\left.\begin{array}{l} 850 = +0'\cdot 6 \\ 927 = +1'\cdot 6 \\ 986 = -1'\cdot 9 \end{array}\right\} = -0'\cdot 7.$$

Even the ancient observations are represented as well as by Prof. Newcomb's correction, the residuals being

−660 = +17′,
−381 = + 7′,
−189 = + 7′,
−134 = + 3′.

These results render very problematical the existence of any tidal retardation in the rotation of the Earth, by showing that it is possible to tolerably well represent the motion of the Moon with only the theoretical value of the secular acceleration.

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It is remarkable that the ancient eclipses should uniformly indicate a greater value for the secular acceleration than the Arabian observations. In fact, to reconcile the two it is essential to suppose that there exists a term of very long period in the Moon's longitude. A term with a period of two or three thousand years—and it has been already shown that terms of this period exist—and a coefficient only three or four times larger than that of Hansen's term would completely reconcile the two classes of observations.

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## *Observations of the Periodic Comet of Tempel*, 1878.

### By Prof. C. Pritchard.

| Oxford Mean Time of Observation. | | Apparent R.A. of Comet. | Log Factor of Parallax in R.A. | Apparent N.P.D. of Comet. | Log Factor of Parallax in N.P.D. | Star of Comparison. |
|---|---|---|---|---|---|---|
| | h m s | h m s | | ° ′ ″ | | |
| July 27 | 10 40 25·8 | 15 26 2·29 | 8·5287 | 97 29 57·7 | 9·9150 | *a* |
| ,, 28 | 11 10 2·5 | 15 27 26·01 | 8·5564 | 97 55 46·9 | 9·9125 | *b* |
| ,, 31 | 10 8 42·3 | 15 31 52·86 | 8·4972 | 99 14 28·5 | 9·9228 | *c* |
| ,, 31 | 10 11 47·7 | 15 31 52·93 | 8·5023 | 99 14 26·7 | 9·9224 | *c* |
| Aug. 1 | 10 10 31·5 | * 4 18·63 | 8·5069 | * 5 6·3 | 7·9230 | |

The assumed mean positions of the stars for January 1, 1878, are

| | | |
|---|---|---|
| | h m s | ° ′ ″ |
| *a* | 15 26 33·85 | 97 40 8·7 |
| *b* | 15 28 11·06 | 97 31 20·9 |
| *c* | 15 32 55·37 | 99 11 17·8 |

The Comet resembled a faint round nebula of about 1′ in diameter. The condensation was very slight, and the observations refer to the centre of the nebulosity. The observation on July 28 is very uncertain, unfavourable atmospheric circumstances rendering the comet very faint. The second observation on July 31 was made by Mr. Jenkins. The star of comparison on August 1 has not been found in any Catalogue. The observations were made with the Grubb 12¼-inch refractor, by the first assistant, Mr. W. Plummer.

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## *Observation of Encke's Comet.* By J. Tebbutt, Esq.

With the help of Dr. von Asten's Ephemeris, in No. 2197 of the *Astronomische Nachrichten*, I succeeded in finding Encke's Comet on the evening of the 3rd instant. It presented the appearance of a small round nebula gradually condensed towards the centre, and was within a few minutes of arc of the position